of muscle and nerve. The mechanical phenomena of the circulation are also adequately treated in a series of exercises on an ingeniously constructed artificial scheme.

It would have been better, we think, to omit much of the elementary physics which bulks so largely in some of the chapters. The simple experiments on magnetic induction, lines of force and electromagnetic induction, given in Chapter II., would be in their proper place in a manual of practical physics. We doubt the wisdom of encouraging the medical student to neglect his physics, as he so often does at the period of his preliminary scientific studies, in the sure and certain hope that 'all he really requires,' the titbits of that severe and repellant science—will be served up to him later on in semi-digested form in the course of physiology.

The proofs have been read with commendable care, and few actual errors have escaped detection. On page 188, however, it is wrongly stated that 'in muscle the electrotonic currents are much stronger than in nerve.' The assertion, on page 189, that 'the electrotonic currents are absent in nerves which lack a myelin sheath' seems a little too absolute, although everybody admits that they are weaker than in medullated nerves. On page 250 one is rather staggered by the argument that 'were the slow passage of the blood in the capillaries due simply to friction, the blood would move still more slowly in the veins because the retarding influence of the friction in the viens would be added to that of the capillaries.' This would hold true if the blood possessed only kinetic energy. But since the blood in the capillaries is under a higher pressure than in the veins, there is a surplus of potential energy which is capable of being converted into kinetic.

It is a good idea to encourage the learner to discuss his results by setting him here and there a definite question for consideration. A critical comparison of the isotonic and isometric causes of contraction (pp. 221, 229) affords a valuable mental gymnastic to the student who has just been exercising his manual dexterity in obtaining them. And if Swift could extract an elegant meditation (according to the style and manner of the Hon. Robert Boyle) from so dry a piece of timber as a broomstick, the ingenuous reader will waste no sympathy on the twentieth-century medical student, even when he is requested to tackle a somewhat unpromising theme, to write, for example (according to his own style and manner) 'a critical account of the muscle-lever in his laboratory note-book.'

G. N. I. S.

Theory of Functions of a Complex Variable. By A. R. FORSYTH, Sc.D., F.R.S., Fellow of Trinity College, Cambridge, Sadlerian Professor of Pure Mathematics. Second Edition. Cambridge, at the University Press. 1900. 8vo. Pp. xxiv + 782.

The publication of a second edition of Professor Forsyth's very valuable and comprehensive work on the theory of functions is a matter of no little interest and importance to the mathematical world. The first edition, which appeared in the spring of 1893, was the first extended systematic presentation in English of a field of modern mathematics now generally recognized as the most useful as well as the most fascinating. Furthermore it was the most comprehensive treatise on the subject in any language, treating a greater number of departments, exhibiting a greater variety of methods, and giving more references to important original contributions than any previous work. Its position in all these respects has been modified since only by a single work, the elaborate historical and bibliographical report of Professors Brill and Noether published in the third volume of the 'Jahresbericht der deutschen Mathematiker-Vereinigung.'

The new edition has been enlarged by about one hundred pages. By means of these additional pages and also by omitting about twenty pages devoted in the earlier edition to binomial differential equations, the author has been enabled to introduce an elementary discussion of the birational transformations and to give some account of Abel's theorem and its applications.

In the work of revision many improvements in the details of presentation have been introduced. The author has altered the wording of a considerable number of theorems and demonstrations which before contained slips of one sort or another. The work has thereby gained

on the side of scientific precision without becoming less agreeable to read or less easy to understand.

It would, of course, be absurd to expect a work of the magnitude and scope of the present one to be free from errors of both omission and commission.* The present writer may be permitted to point out one of the former sort which seems particularly serious, viz: the omission of the fundamental proof of Cauchy relative to the continuity of the roots of an algebraic equation. On page 181 of the new edition, as on page 162 of the old edition, the author simply takes it for granted that when the independent variable changes continuously, so will every root of the algebraic equation.

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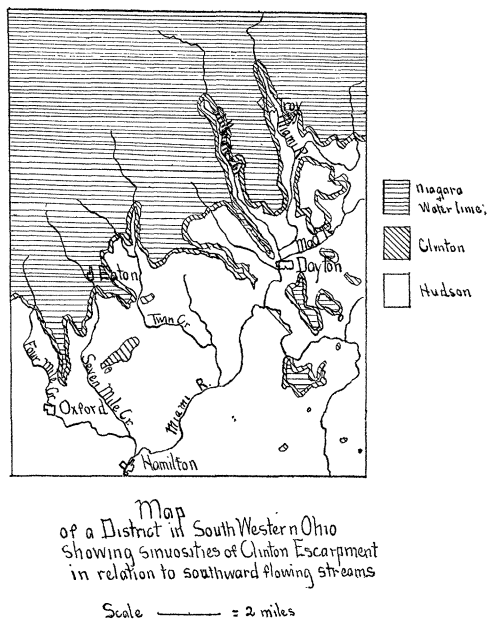
DISCUSSION AND CORRESPONDENCE.

PREGLACIAL DRAINAGE IN SOUTHWESTERN OHIO.

TO THE EDITOR OF SCIENCE: In SCIENCE for August 9, reference is made, in a review of Professor W. M. Davis, to recent papers by Tight, Bownocker, Todd and Fowke upon the subject of 'Preglacial Drainage of Ohio.' In particular Mr. Fowke is represented as advocating for the Licking and Kentucky rivers a continuance of their courses northward by way of a reversed Miami river or some of its tributaries. There seems to me to be an objection to this theory, which will become apparent to any one who will study the relation of the channels of the Miami river and its principal tributaries to the boundary outcrop of the lower and upper Silurian formations in that region. In a district where the dip of the rocks is very slight, not over four feet to the mile to the northward, all the reentrant angles, formed in a retreating Clinton limestone escarpment, look as if they had been formed by up-stream cutting action of southward-flowing streams. Note on the accompanying map not only the major northeastern reentrant of the Big and Little Miami rivers combined, but also the minor reentrants of the tributaries to the Big Miami from the northwest—those of Four Mile, Seven Mile, Twin and Stillwater Creeks, and that of the upper Miami itself. This Clinton escarpment only here and there peeps out from under its heavy mantle of glacial drift. Evidently there has been no retreat of these escarpments since the glaciers themselves retreated. The veneering of glacial drift has stereotyped this preglacial topography. It is true that geological boundary reentrants



Map of a District in South Western Ohio Showing sinuosities of Clinton Escarpment in relation to southward flowing streams

Scale ——— = 2 miles

may point down stream. South of the Ohio, one is seen in the lower course of the Kentucky River—the Trenton—Hudson boundary reentrant. This is accounted for by the average dip of the rocks to the northwest on this slope of the Lexington uplift being 12 feet to the mile, while the fall of the river in the same is only 1.2 feet per mile. In order that the reentrants northwest of the Miami River should have been made by streams in that region having a reversed drainage, the average gradients of these streams could not have been greater than four feet to the mile. Four feet to the mile is about the present southwest fall of the Miami River itself, a much steeper gradient

* For a careful analysis of the first edition see Professor Osgood's review published in the *Bulletin of the American Mathematical Society*, Vol. I. (1894–5), pp. 142–154. Some of the criticisms which appear there apply equally to the present edition.